

Step-by-Step Solutions  
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FROM THE MAKERS OF WOLFRAM LANGUAGE AND MATHEMATICA

**WolframAlpha**

e^ipi



Assuming i is the imaginary unit

Input

$e^{i\pi}$



Result

-1



Step-by-step solution

Wolfram|Alpha Step-by-step solution



Result:

STEP 1

Simplify the following:

$e^{i\pi}$

Hint: Evaluate  $e^{i\pi}$ .

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Number line



Alternative representations

$e^{i\pi} = (-1)^{-i}$



$e^{i\pi} = e^{180^\circ i}$



$e^{i\pi} = e^{-i^2 \log(-1)}$



$e^{i\pi} = \exp^{i\pi}(z)$  for  $z = 1$



$e^{i\pi} = \exp^{i 180^\circ}(z)$  for  $z = 1$



$e^{i\pi} = e^{2 i^2 \log((1-i)/(1+i))}$



$e^{i\pi} = \exp^{i(-i) \log(-1)}(z)$  for  $z = 1$



$e^{i\pi} = \exp^{i 2 \left( i \log \left( \frac{1-i}{1+i} \right) \right)}(z)$  for  $z = 1$



Less



Series representations

$e^{i\pi} = \left( \sum_{k=0}^{\infty} \frac{1}{k!} \right)^{4 i \sum_{k=0}^{\infty} (-1)^k / (1+2 k)}$



$e^{i\pi} = \left( \sum_{k=0}^{\infty} \frac{(-1+k)^2}{k!} \right)^{4 i \sum_{k=0}^{\infty} (-1)^k / (1+2 k)}$



$e^{i\pi} = \left( \sum_{k=0}^{\infty} \frac{1}{k!} \right)^{i \sum_{k=1}^{\infty} 4^{-k} (-1+3^k) \zeta(1+k)}$



$e^{i\pi} = \left( \frac{1}{\sum_{k=0}^{\infty} \frac{(-1)^k}{k!}} \right)^{4 i \sum_{k=0}^{\infty} (-1)^k / (1+2 k)}$



$e^{i\pi} = \left( \sum_{k=0}^{\infty} \frac{1}{k!} \right)^{4 i \sum_{k=1}^{\infty} \tan^{-1} \left( 1 / F_{1+2 k} \right)}$



$e^{i\pi} = \left( \sum_{k=0}^{\infty} \frac{(-1+k)^2}{k!} \right)^{4 i \sum_{k=1}^{\infty} \tan^{-1} \left( 1 / F_{1+2 k} \right)}$



$e^{i\pi} = \left( \frac{1}{\sum_{k=0}^{\infty} \frac{(-1)^k}{k!}} \right)^{i \sum_{k=1}^{\infty} 4^{-k} (-1+3^k) \zeta(1+k)}$



$e^{i\pi} = \left( \frac{1}{\sum_{k=0}^{\infty} \frac{(-1)^k}{k!}} \right)^{4 i \sum_{k=1}^{\infty} \tan^{-1} \left( 1 / F_{1+2 k} \right)}$



Less



Integral representations

$e^{i\pi} = e^{2 i \int_0^{\infty} 1 / (1+t^2) dt}$



$e^{i\pi} = e^{4 i \int_0^1 \sqrt{1-t^2} dt}$



$e^{i\pi} = e^{2 i \int_0^{\infty} \sin(t) / t dt}$



$e^{i\pi} = e^{2 i \int_0^{\infty} \sin^2(t) / t^2 dt}$



$e^{i\pi} = e^{3 i \int_0^{\infty} \sin^4(t) / t^4 dt}$



$e^{i\pi} = e^{(8 i) / 3 \int_0^{\infty} \sin^3(t) / t^3 dt}$



$e^{i\pi} = e^{(40 i) / 11 \int_0^{\infty} \sin^6(t) / t^6 dt}$



$e^{i\pi} = e^{(384 i) / 115 \int_0^{\infty} \sin^5(t) / t^5 dt}$



Less



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e^(i x)



CAPTCHA exp(i pi)



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pi^(i e)



Euler identities



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